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UNITED STATES DEPARTMENT OF AGRICULTURE
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PORTABLE SPRINKLING IRRIGATION FROM A TRAIN OF SLEDS

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For large acreages of low-growing crops, such as strawberries, lettuce, and spinach, on reasonably level land, a sled-type portable irrigation system may be used. Such equipment has recently been developed and used by the Bureau of Agricultural Engineering. (See figures 1 to 4.)

Because of the large investment required and the small amount of use of sprinkling irrigation equipment, there is considerable urge, in most cases, to use portable equipment for at least part of the system. With the overhead-pipe type the spray nozzle pipes are often made portable. The large vegetable farms equipped with this sort of equipment quite commonly move a whole spray nozzle pipe as a unit. To do this ordinarily one man is required for each 35 or 40 feet of pipe. This requires 5 or 6 men to move even a 200-foot spray pipe, and more if the pipes are longer. It is frequently difficult to assemble that number of men every time a spray pipe has to be moved. To meet this situation, manufacturers of spray equipment have developed quick-assembling unions or "jiffy couplings" so that suitably equipped spray pipe lines can be readily taken apart and moved piecemeal and then easily reassembled with whatever number of men may be available. Neither of these methods is wholly satisfactory, however, and portable spray nozzle pipes are nearly always replaced by permanent lines as soon as the owner is financially able to do so.

To overcome some of the difficulties mentioned, the spray nozzle pipe may be mounted on wheels as described in a report previously issued ^{1/} or on a train of wooden sleds.

When mounted on sleds the pipe can be readily moved by one man and one or two good horses or a tractor. To get maximum benefit from a sled-type system it is important that the long way of the field be several times, say 5 to 9 times, the length of the spray line, because it is not economical to build the portable equipment unless it can be used in several successive positions at each irrigation. On the basis of present information it appears that the desirable length of the portable spray lines ranges from 180 to 300 feet. This would place the desirable length of the field between 900 to 2,700 feet. In width the field may be any

^{1/} A mimeographed report of the wheel type of equipment may be obtained by addressing the U.S. Bureau of Agricultural Engineering, Washington, D.C.

desired multiple of 48 or 50 feet or less, but for a width of less than 300 feet the wheel type of portable irrigation system is probably better.

Any simple double-end sled will serve. A good size is 16 inches wide outside by 30 inches long, as shown in detail in the sketch attached. The runners were made of 1-1/8-inch cypress boards, rounded on the bottom at both ends to allow them to be drawn either forward or backward. An extra cross-bar and a block to strengthen the runners, all shown in figure 2, were used in the outfit referred to.

The sleds for supporting each nozzle line are placed 15 feet apart and are drawn either forward or backward by two strands of No. 9 galvanized steel wire, passed along the length of the train on the outside of each sled runner. The wires are fastened to the sleds by staples. Short lengths of the same heavy wire are passed inside of each runner, the ends of which are tightly wrapped around the long wire used in pulling the train of sleds. At each end of the train of sleds the ends of the two long wires are brought together and twisted securely. When the sleds are to be moved the wire loop thus formed is passed through the ring of the singletree and held by a wooden stick.

On lines of sleds thus made the portable spray pipes are placed, and held from rolling off by nails, or preferably by wooden blocks, spaced 4 inches apart, as shown in figures 2 and 4. Sleds should be placed 15 feet apart, and the ends of the pipe should not extend more than about $2\frac{1}{2}$ feet beyond the end sleds.

Desirable sizes of spray nozzle pipes depend on the amount of water to be handled. The following sizes are recommended:

<u>Length of nozzle pipe line</u>	<u>For nozzles 3 feet apart</u>	<u>For nozzles 4 feet apart</u>
180 - 200 feet	1 inch	1 inch
201 - 250 "	1-1/4 "	1 "
251 - 300 "	1-1/4 "	1-1/4 "

The pipe used should be the same size throughout its length so that either end may be attached to the water supply. Directions for drilling and tapping the nozzle pipe lines may be found in Farmers' Bulletin No. 1529, "Spray Irrigation in the Eastern States," issued by the U.S. Department of Agriculture.

A complete list of materials has been prepared for a typical installation on a field 1,200 feet by 300 feet, or 8-1/3 acres in size. As the field is 300 feet wide, six portable units spaced 50 feet apart and parallel would be required, each having a nozzle pipe line 200 feet long. The 1,200-foot length of field could thus be watered by using each sled train in six positions. Figure 1 shows field, portable pipe and permanent pipe arrangement.

As it is impracticable, when moving from one position to another, to attempt to bring the train of sleds bearing the portable nozzle pipes to a stop at a definite point with great exactness, connection to the hydrants of the permanent underground lateral supply pipes is made with short lengths of flexible rubber hose (fig. 3). These permanent laterals should be placed to cross the line of travel of the portable sleds at suitable intervals and should in turn be connected to a main water supply pipe running down the length of the field.

For an 8-1/3-acre field as described in the above example the nozzle pipe lines can be made of 1-inch pipe. The following is a complete list of materials for such an outfit arranged in the order in which the parts should be assembled. Prices given are recent quotations by a mail-order house insofar as the items were listed in its catalogue. Prices of wrought steel pipe (the common type of commercial water and gas pipe with threaded ends) and fittings, if not carried by the mail-order house, are given as one-half the manufacturer's list price. In the case of a few items, namely rubber hose, hose nipples, sleds, valve boxes, turning unions, and irrigation nozzles, other means of determining prices were used and the prices quoted are believed correct. It is assumed that the water supply is located at one corner of the field.

Double-end sprinkling lines

10-foot length 1-1/4-inch flexible rubber water hose	\$4.40
1 - 1-1/4-inch by 1-inch hose nipple, brass (2 male ends, 1-1/4-inch hose thread and 1-inch iron-pipe thread)	.75
1 - 1-inch street elbow, galvanized	.17
1 - 1-inch gate valve, brass or bronze	1.15
1 - 1-inch nipple 3 inches long, galvanized	.05
1 - 1-inch turning union 1/2 with strainer	3.00
200 feet 1-inch steel pipe, galvanized	19.84
1 - 1-inch turning union 1/2 with strainer	3.00
1 - 1-inch nipple, 3 inches long, galvanized	.05
1 - 1-inch gate valve, brass or bronze	1.15
1 - 1-inch street elbow, galvanized	.17
1 - 1-1/4-inch by 1-inch hose nipple, brass (2 male ends, 1-1/4-inch hose thread and 1-inch iron-pipe thread)	.75
67 - irrigation nozzles at \$.05	3.35
14 - sleds (estimated at \$2.00)	28.00
600 feet of No. 9 steel wire, galvanized	1.16

Total for 1 portable spray line \$66.99

Six required for a field 300 feet wide, at \$66.99 each...\$401.94

1/ A special overhead-pipe-spray irrigation fitting.

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Hydrants

1 - 1-1/4-inch hose nipple, brass (hose thread, female end, (iron pipe thread male end)	\$.75
1 - 1-1/4-inch elbow, galvanized	.20
1 - 1-1/4-inch nipple 3 inches long, galvanized	.08
1 - 1-1/4-inch gate valve, brass	1.35
1 - 1-1/4-inch nipple 3 inches long, galvanized	.08
1 wooden valve box (estimated)	.50
Total for one hydrant	\$2.96

36 hydrants required for field 1,200 feet
by 300 feet at \$2.96 each \$106.56

Laterals

1 - 1-1/2-inch plug, black	.09
1 - 1-1/2-inch by 1-1/4-inch tee, black	.25
50 feet of 1-1/2-inch pipe, galvanized	8.03
1 - 2-inch by 1-1/2-inch by 1-1/4-inch tee, black	.39
50 feet of 2-inch pipe, galvanized	10.83
1 - 2-1/2-inch by 2-inch by 1-1/4-inch tee, black	.89
50 feet - 2-1/2-inch pipe, galvanized	17.08
1 - 2-1/2-inch by 1-1/4-inch tee, black	.89
50 feet - 2-1/2-inch pipe, galvanized	17.08
1 - 3-inch by 2-1/2-inch by 1-1/4-inch tee, black	1.24
50 feet of 3-inch pipe, galvanized	22.34
1 - 3-1/2-inch by 3-inch by 1-1/4-inch tee	1.96
1 - 3-1/2-inch nipple 3 inches long	.46
Total for one lateral	\$81.53

Three required for field 1,200 feet long,
at \$81.53 each 244.59

Main Pipe

1 - 3-1/2-inch plug, black	.29
1 - 3-1/2-inch by 3-1/2-inch by 3-inch tee, black	1.78
400 feet of 3-1/2-inch pipe, black	184.00
1 - 3-1/2-inch by 3-1/2-inch by 3-inch tee, black	1.78
400 feet of 3-1/2-inch pipe	184.00
1 - 3-1/2-inch by 3-1/2-inch by 3-inch tee, black	1.78
200 feet of 3-1/2-inch pipe to edge of field	92.00
Total for main pipe	\$465.63

Total for field equipment on 8-1/3 acres \$1,218.72
Cost per acre \$147.50

The cost of a well or reservoir and pump and engine or motor would ordinarily be required in addition to the above. The layout for the permanent distribution piping is so designed that the portable nozzle pipes can be replaced if desirable by permanent nozzle pipes without any change in the distribution system.

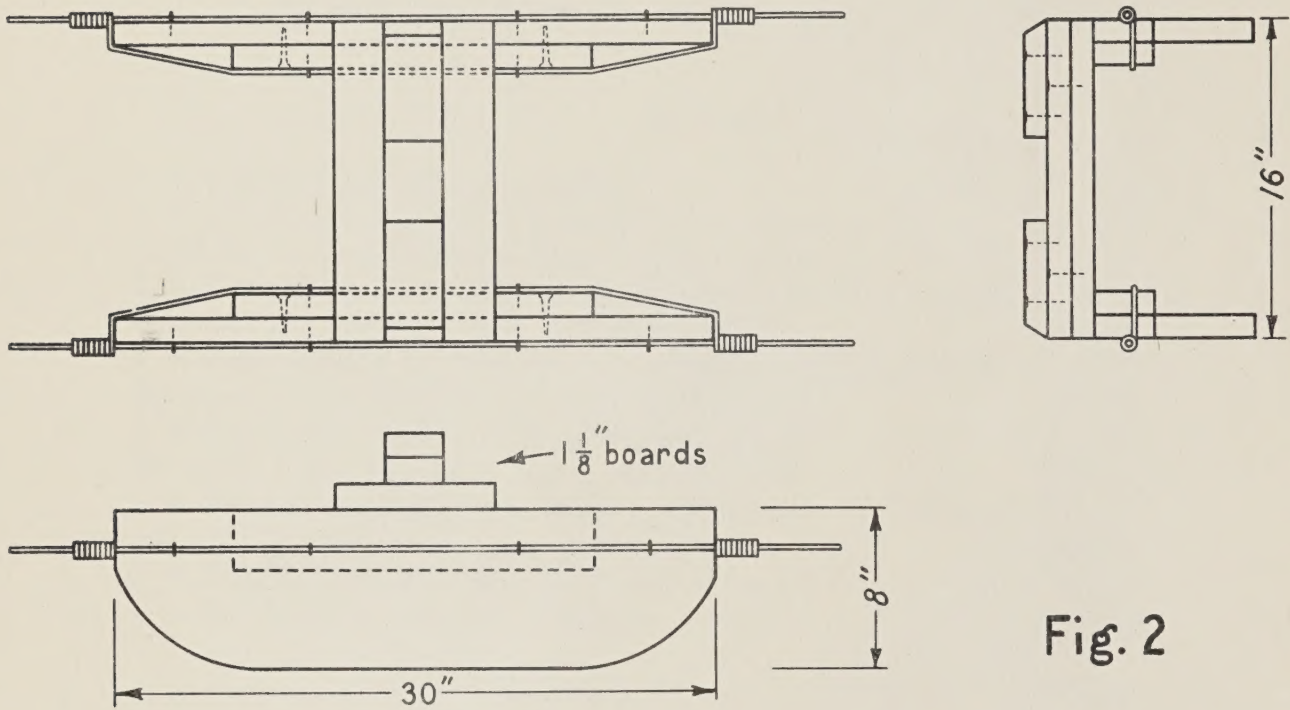
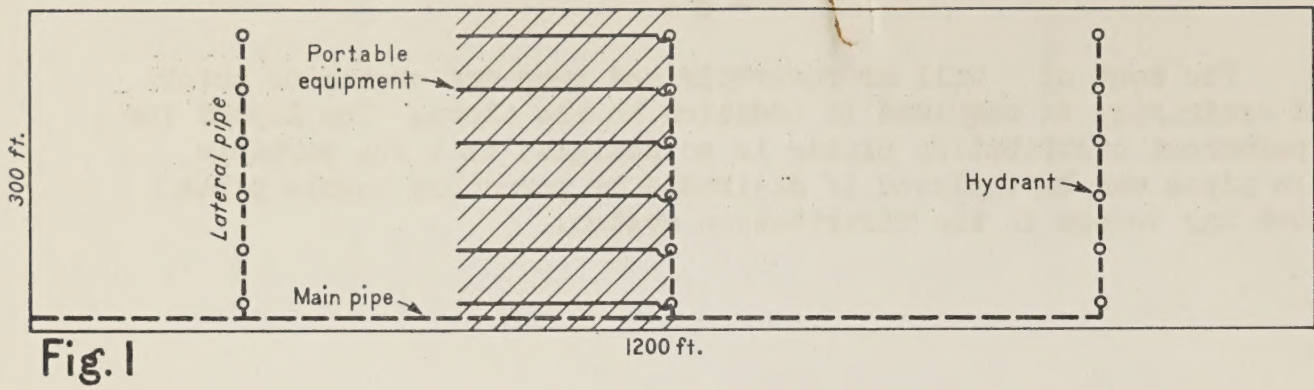


Fig. 2

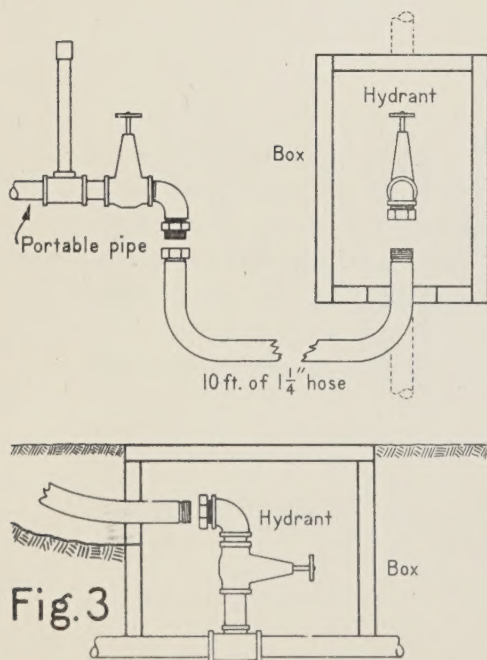


Fig. 3

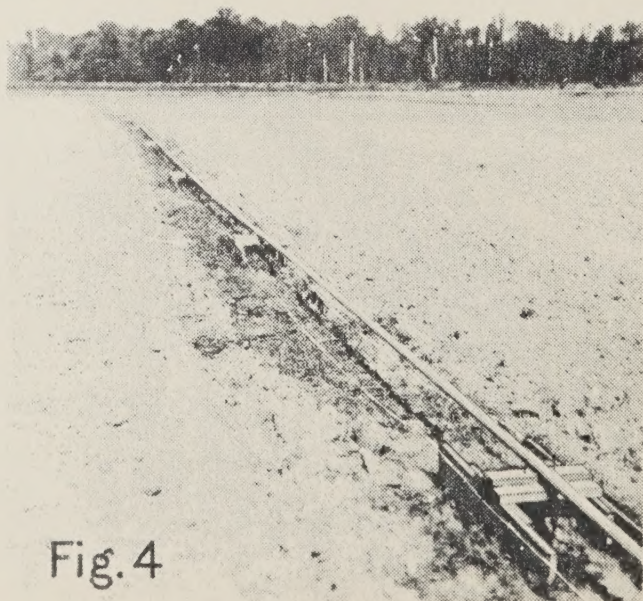


Fig. 4